General Ecology, Inc. – First Need® Trav-L-Pure

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Device Information

The General Ecology, Inc., First Need Trav-L-Pure is a handheld pump water treatment device utilizing what the manufacturer calls a proprietary "structured matrix" media for pathogen reduction. According to the manufacturer, the reduction process consists of microfiltration (0.1 µm nominal, 0.4 µm absolute pore size), chemical adsorption, and electrochemical attraction. The proprietary media consists of a block of activated carbon treated to enhance retention of viruses and other microorganisms by way of association with the media surface. The device consists of a black plastic housing containing a pump, filter canister, and two pre-filters. Raw water is poured through the first pre-filter and into the plastic housing. As the pump is operated, creating pressure on the down stroke only, water is forced through the second prefilter, up through the filter canister and out of the effluent spout. The user places a clean container under the spout to capture the purified water. The device is a single purification unit with plastic lid, blue dye for integrity testing, and a water resistant carrying bag with shoulder strap.

Effectiveness Against Microbial Pathogens

No data was received specific to this device. Results from an independent study using the General Ecology First Need Deluxe (reference 1, 2) show that when challenged against the U.S. Environmental Protection Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3), that device met the required pathogen log reductions, based on geometric averages of three identical devices. During testing, production capacity was set at 378 L per device and flowrate at 0.476 L/min, both below the manufacturer stated values. The Trav-L-Pure device uses the same removal canister as the First Need Deluxe so similar results can be expected. Since the data reviewed was for not for the Trav-L-Pure and was for a production rate below the manufacturer stated rate, one √ is assigned for pathogen reduction (click here for rating explanation), indicating that expert opinion expects this device to meet the requirements of reference 1. More data, specific to this device, is required for a higher rating.

® First Need is a registered trademark of General Ecology, Inc., Exton, PA. Use of trademarked products does not imply endorsement by the U.S. Army, but is intended only in identification of a specific product.

Table. Expected Performance Against Microbial Pathogens.

Microbial Pathogen Type	Expected Disinfection Capability	Evaluation Rating	Primary Pathogen Reduction Mechanism
Bacteria	> 6-log	√	size exclusion
Viruses	> 4-log	√	electrostatic attraction
Giardia cysts	> 3-log	√	size exclusion
Cryptosporidium oocysts	> 3-log	√	size exclusion

Production Rate and Capacity

Inherent to the production rate and capacity of filtration devices is the quality of the raw water source. Manufacturer stated production rate is 1.25 L/min, and overall capacity of the media canister is 400 L. Capacity will vary widely with raw water turbidity. The flowrate used during microbial pathogen studies was 0.476 L/min, far below the 1.25 L/min manufacturer stated flowrate during normal operation.

Cleaning, Replacement, and End of Life Indicator

When pumping becomes difficult or after 400 L of water have passed through the device the canister must be replaced. This device is not capable of being backwashed. Instructions recommend that the device be flushed with 1 pint of dilute bleach (0.25 tsp / gallon) or iodine solution before and after periods of extended storage. Device instructions state to conduct integrity testing prior to each trip, and if device freezes or is subject to shock loads. Integrity testing consists of adding provided blue food dye to water then pumping it through the device. If even the faintest of blue color is present in the processed water, the canister must be replaced.

Weight and Size

The dry weight of the device is 630 grams including the 0.65 L canteen. Dimensions are 16.8 cm x 11.2 cm x 8.4 cm (length x width x height).

Cost

Trav-L-Pure	$156.00
Replacement canister	$42.00

Device Evaluation

No data was received specific to challenging the General Ecology, Inc., First Need Trav-L-Pure against reference 3. Based upon independent published data (reference 1) reviewed for the General Ecology First Need Deluxe, utilizing the same treatment technology, the First Need Trav-L-Pure should be capable of meeting the requirements of reference 3. Bacteria and cyst reduction based on size exclusion by microfiltration is a proven technology and an intact membrane will effectively reject these microbes (reference 4). Virus removal by the "structured matrix" is based on electrochemical attraction, and although shown to be effective under laboratory conditions, is not considered as consistent of a reduction mechanism as size exclusion. Virus attraction to solid surfaces is highly affected by virus type, charge, and water pH, and therefore, removal efficacy is highly variable (reference 5). There also exists the possibility for release of previously attracted viruses from this media under certain water quality conditions. Since this device utilizes electrochemical adsorption, the flowrate through the device can have a dramatic effect on pathogen reduction. To ensure safe water production, the device should not be operated above the flowrate of 0.476 L/min or beyond the production capacity of 378 L, the flowrate and capacity shown to meet the above pathogen reductions (reference 1). Users cannot be expected to regulate flowrate during production, adding uncertainty to the expected virus reduction claims, and stressing the importance of laboratory testing at device recommended conditions. The filter media contains activated carbon that uses adsorption for virus removal. The carbon has a finite number of sites for virus adsorption and once exhausted the ability of the device to remove viruses is questionable. This device requires no chemical addition and no wait time prior to water consumption. There is no indicator of process failure on a real-time basis, and the end of device useful life is based on integrity testing, filter clogging, or by the user keeping track of the volume of water purified. Inherent to treatment devices utilizing small pore size membranes is the likelihood of clogging when processing highly turbid raw water. Depending on source water quality, device production capacity may vary widely. Although this device uses two pre-filters, this inherent disadvantage is still valid. Integrity testing of the device, recommended before expected use and after freezing of device, entails visual inspection of product water after placing blue dye in the raw source. The ability of the user to detect slight color change is uncertain, making this a questionable technique for determining device failure. Device instructions state not to allow device to freeze. Device temperature range stated at 33 - 145º F. No storage life is stated.

Advantages

- Independent testing for a device utilizing the same technology confirms bacteria, virus, and protozoan reduction in accordance with the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3) at a reduced flowrate and production capacity.
- No chemicals required.
- No wait time prior to consumption.

Disadvantages

- No data supplied for this specific device that shows pathogen reduction in accordance with the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 3).
- Testing for pathogen reduction efficacy was not conducted at manufacturer stated flow conditions, making applicability of results to actual use questionable.
- Electrochemical virus attraction by proprietary media is not widely proven technology and efficacy may be affected by raw water quality.
- Mechanical sieving inherently prone to clogging with high turbidity waters.
- No ability to backwash device once filter clogs.
- No real-time indicator of process failure.

References

1. Gerba, C.P., and Naranjo, J.E., 2000. Microbiological Water Purification Without the Use of Chemical Disinfection. *Wilderness and Environmental Medicine*. 11:12-16.

2. Independent laboratory results of tests showing compliance with the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifier, 1995. Provided by General Ecology.

3. USEPA, 1989. Guide Standard and Protocol for Testing Microbiological Water Purifiers. *Federal Register*. 54:34067.

4. U.S. Army Center for Health Promotion and Preventive Medicine, 2005. *Technical Information Paper; Filtration in the Use of Individual Water Purification Devices,* Aberdeen Proving Ground, MD.

5. Gerba, C.P., 1984. Applied and Theoretical Aspects of Virus Adsorption to Surfaces. *Advances in Applied Microbiology*. 30:133-168.